Effects of Groundwater Pumping On Streamflow

The Nature Conservancy

January 2014

Key Facts and Lessons

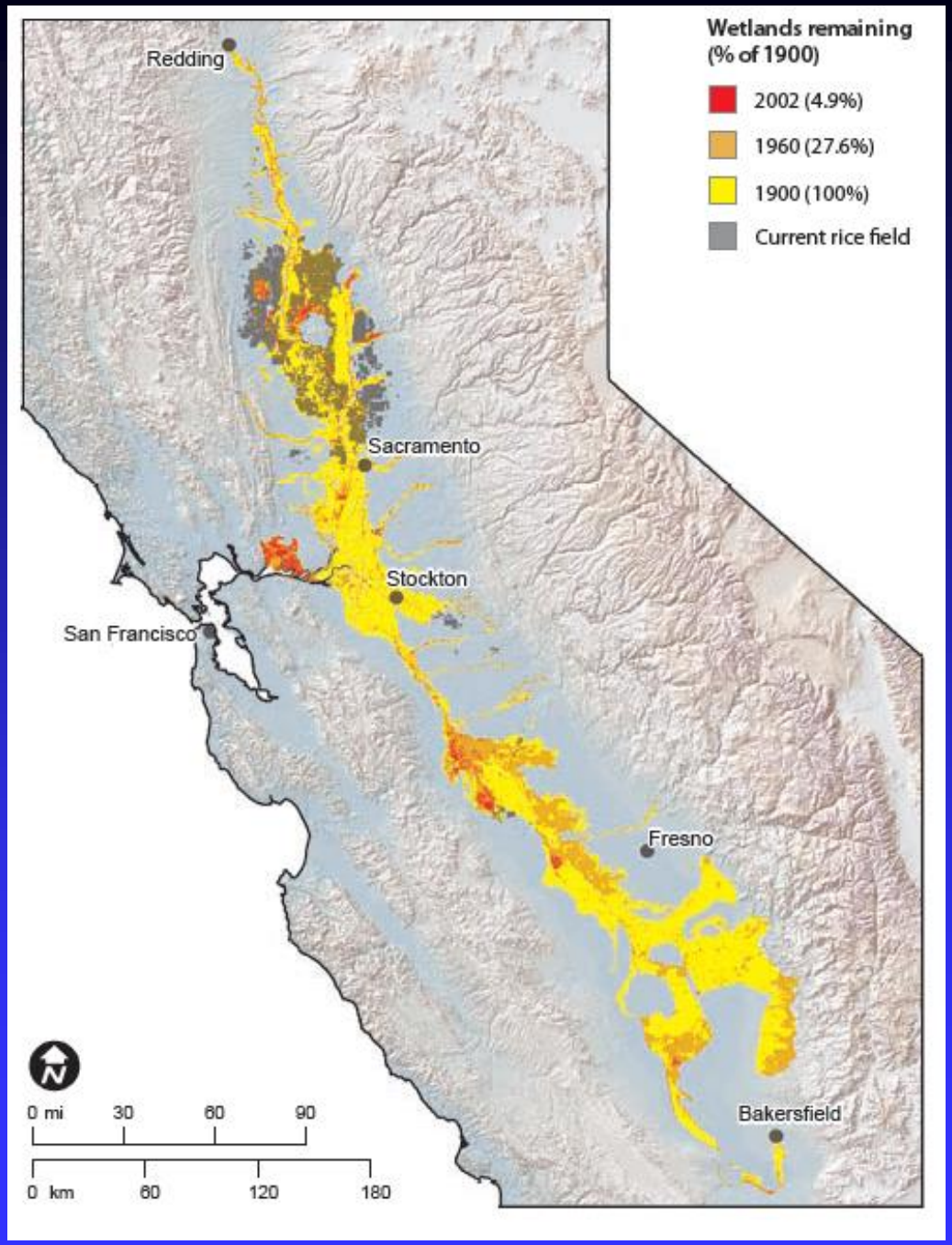
- ***Groundwater and surface water are intimately connected***
  - ➔ What affects one will ultimately affect the other
  - ➔ In many respects, wells are just another way of diverting surface water
  - ➔ Impacts from wells far from streams, and from deep wells, just take longer

- ***GW pumping is only "sustainable" to the degree we accept associated impacts to surface water systems.***
  - ➔ These impacts take years to decades to fully develop – its not WYSIWYG

- ***GW substitution transfers impact streamflows***
  - ➔ Can be valuable, but need to properly account for impacts
  - ➔ These impacts play out over decades

- ***"Safe yield" only protects GW user interests***
  - ➔ Groundwater dependent and riparian ecosystems are impacted
  - ➔ Surface water rights holders are impacted

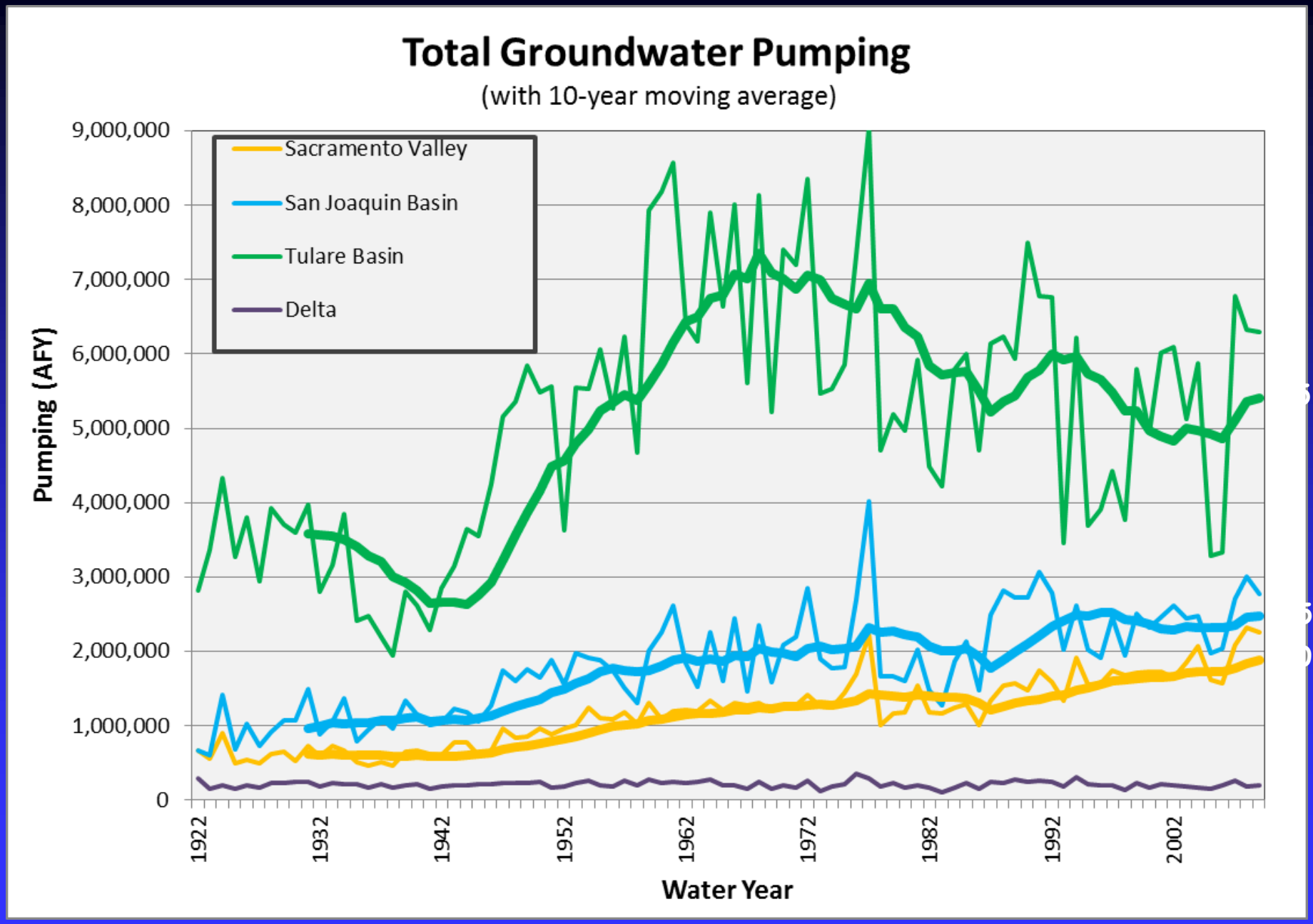
- ***"Sustainable yield" needed to protect ecosystems***
  - ➔ Explicitly allots some natural discharge for nature



"Why we care"

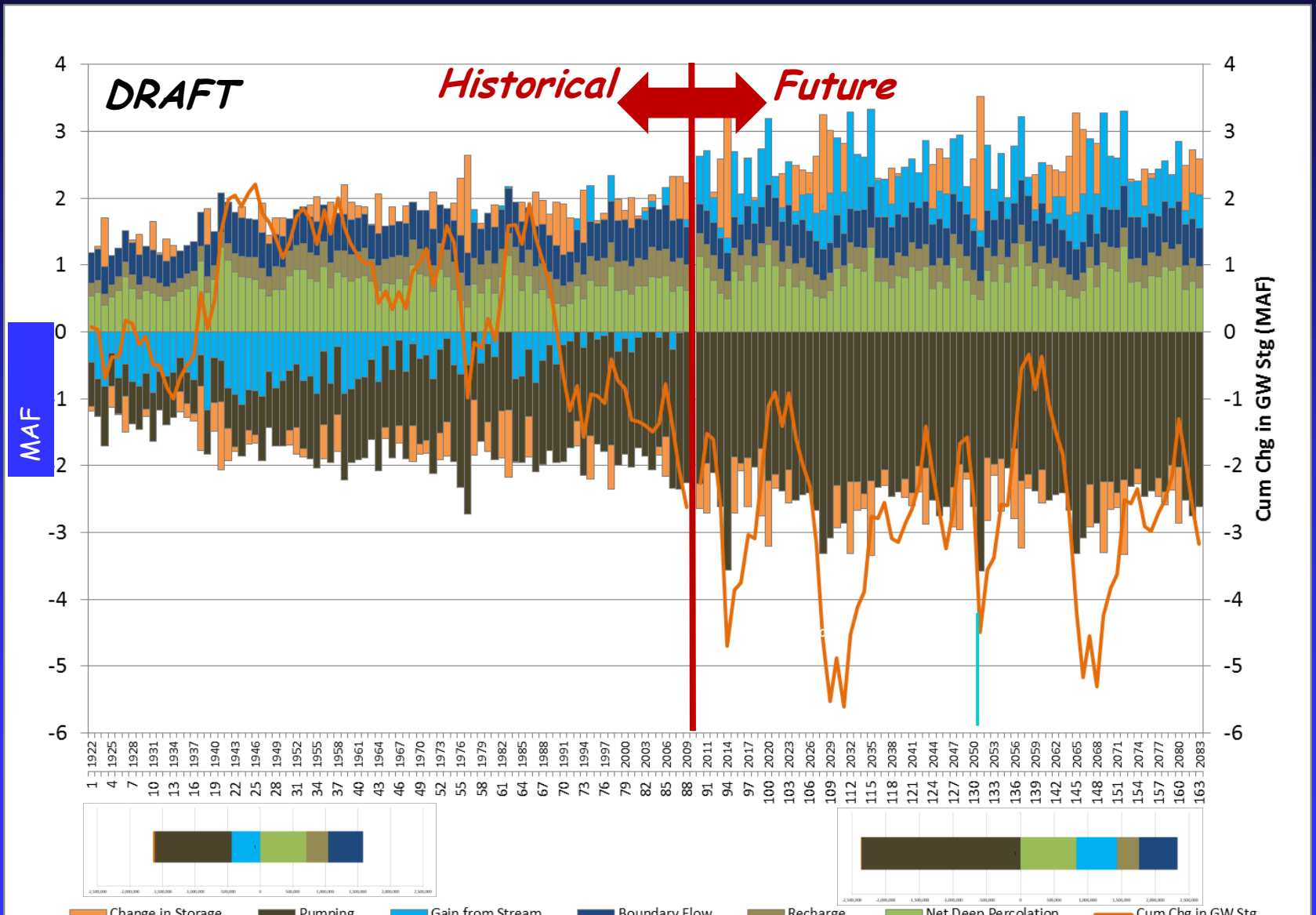
The Central Valley's Lost Wetlands

from "Managing California's Water"
PPIC report, 2011


Total Groundwater Pumping
(with 10-year moving average)
Pumping (AFY)
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Sacramento Valley
San Joaquin Basin
Tulare Basin
Delta
1922
1932
1942
1952
1962
1972
1982
1992
2002
Water Year

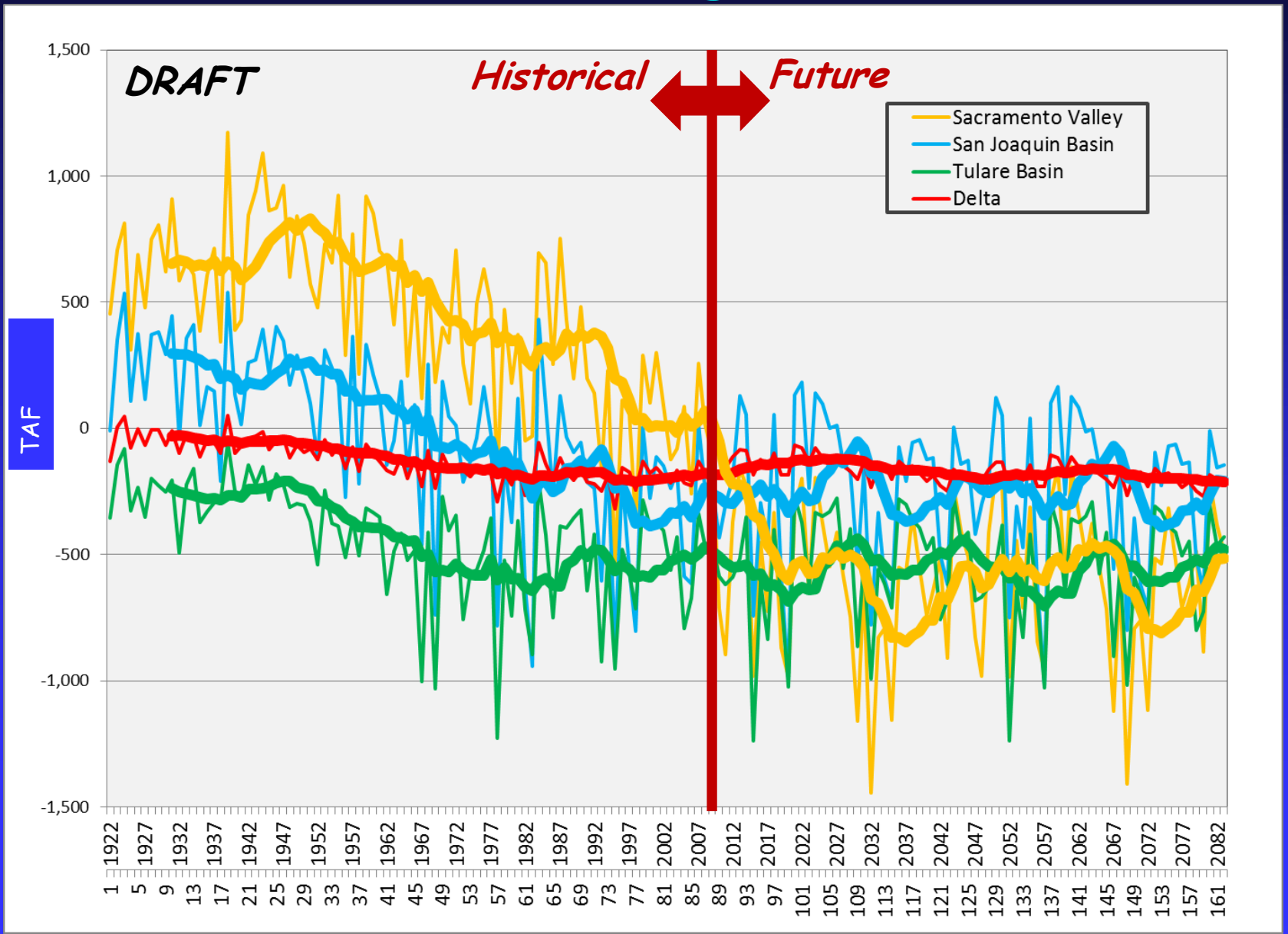
What if current conditions continue?

Is the Sacramento Valley at a Tipping Point?



What if current conditions continue?

Net GW Discharge to Rivers

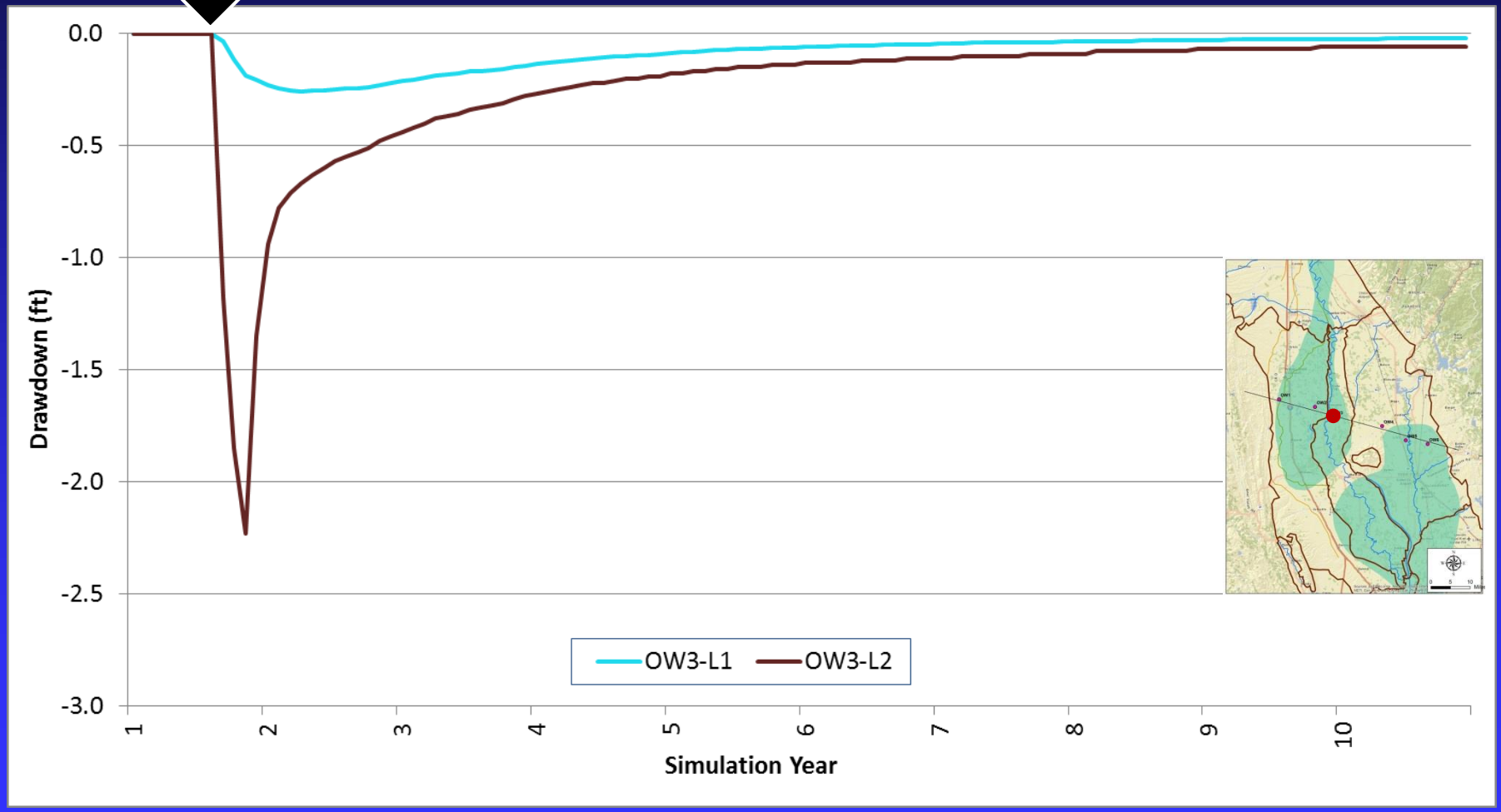


Groundwater Substitution Transfers

What is a GW Substitution Transfer?

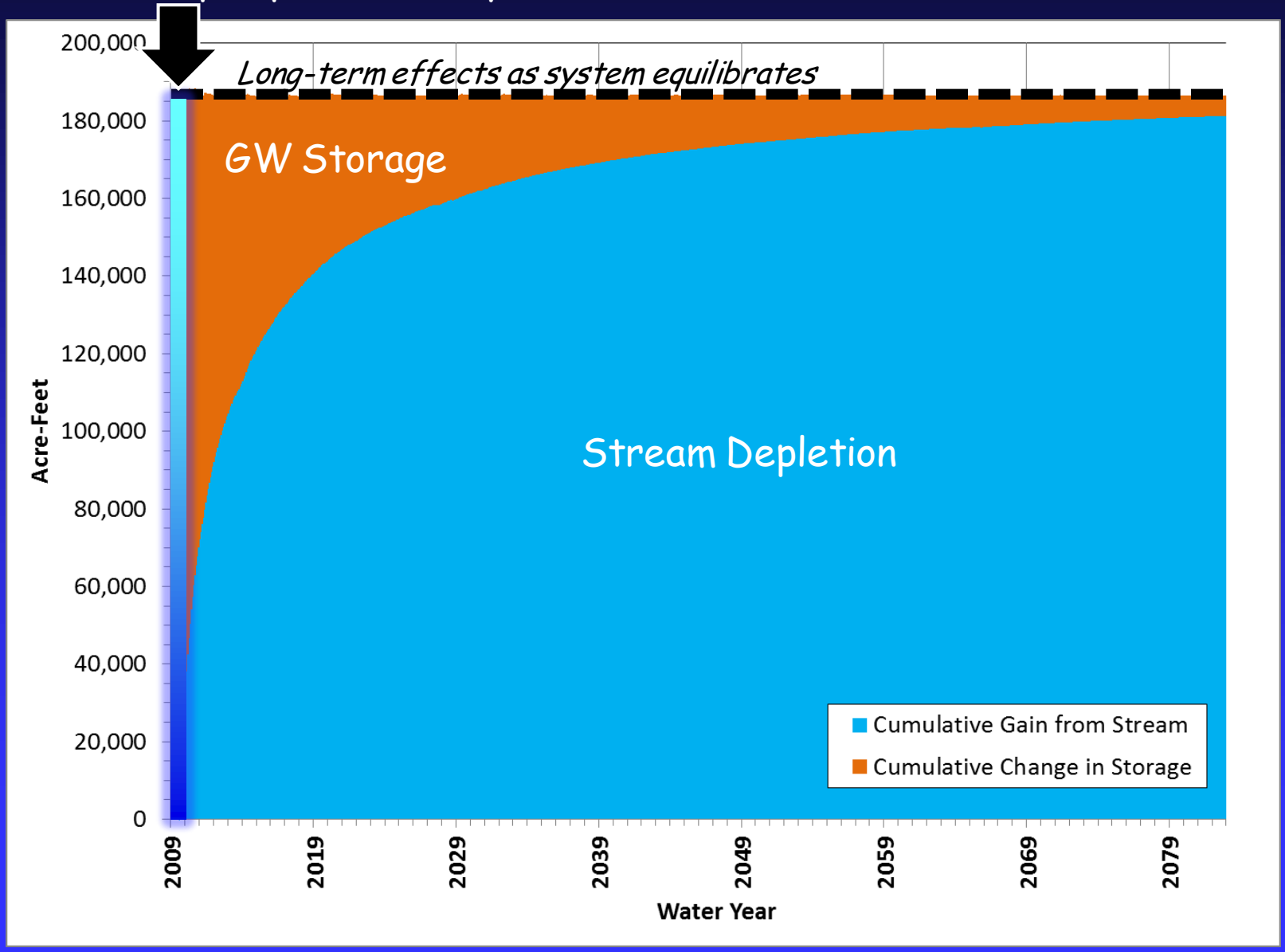
Water Level Recovery Takes Years

Transfer wells pumped for one year



Stream Depletion Occurs for Years

Transfer wells pumped for one year



Closing Comments

- ***The Paramount Basin Management Objective:***
  - ➔ Management of all GW basins to Safe Yield or Sustainable Yield
    - Safe Yield -- for basins currently in overdraft
    - Sustainable Yield -- for all other basins
- ***Act Soon to Limit Basins to Reasonable Yields***
  - ➔ Time is not on our side as pumping continues to increase
  - ➔ Actions need not be perfect since inherent uncertainties in GW systems require an adaptive management approach
- ***Basin Prioritization***
  - ➔ Don't just focus on degree of overdraft
  - ➔ Look at key heavily stressed basins not yet in overdraft
    - An important example is the Sacramento Valley